

# Part II

Logarithmic Equations--Equation with one or more logs

ex  
 $\log_{100} x = -3/2$

$$100^{-3/2} = x$$

$$\frac{1}{100^{3/2}}$$

ex  
 $\log_x \sqrt{5} = 3/2$

$$\log_x \sqrt{5} = 3/2$$

$$(x^{3/2}) = (\sqrt{5})^{3/2}$$

$$x = (5^{1/2})^{3/2}$$

$$x = 5^{1/2}$$

$$x = \sqrt{5}$$

ex  
 $\log_x 64 = 3$

$$x^3 = 64$$

$$x = 4$$

ex  
 $\log_x 3 = -2$

$$(x^{-2})^{1/2} = 3^{1/2}$$

$$x = \frac{1}{3^{1/2}}$$

$$x = \frac{1}{\sqrt{3} \cdot \sqrt{3} \cdot \sqrt{3}}$$

ex  
 $\log_{4x} 9 = 2$

$$(4x)^2 = 9$$

$$16x^2 = 9$$

$$x^2 = \frac{9}{16}$$

$$x = \pm \frac{3}{4}$$

$$\left(\frac{3}{4}\right)$$

Do:

1.  $\log_x 27 = 3/4$

$$(x^{3/4})^{4/3} = 27^{4/3}$$

$$x = 81$$

2.  $\log_6 x = 3$

$$6^3 = x$$

$$x = 216$$

3.  $\log_x 7 = 1/2$

$$(x^{1/2})^2 = 7^2$$

$$x = 49$$

4.  $\log_x \sqrt{5} = 1/4$

$$(x^{1/4})^4 = (5^{1/2})^4$$

$$x = 25$$

Inequalities

If  $b > 1, x > 0$

and  $\log_b x > y$ , then  $b^y < x$

and  $\log_b x < y$ , then  $b^y > x > 0$

Ex

$$\log_8 x < 2$$

$$8^2 > x$$

$$0 < x < 64$$

Ex

$$\log_5 x > 3$$

$$5^3 < x$$

$$x > 125$$

$$\log_b x = \log_b y \text{ iff } x = y$$

ex

$$\log_3 (x+2) = \log_3 (2x)$$

$$x+2 = 2x$$

$$2 = x \checkmark$$

ex

$$\log_{10} (3x - 4) < \log_{10} (x + 6)$$

$$3x - 4 < x + 6$$

$$\frac{4}{2} < x < 5$$

$$3x - 4 > 0 \quad x + 6 > 0$$

$x > \frac{4}{3}$        $x > -6$

Cannot take the log of negative or zero

ex

$$\log_4 x^2 = \log_4 (4x - 3)$$

HW

p536

47-61odd, 54, 62